



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of : Confirmation No. 4795
Yoshiko KOBAYASHI et al. : Docket No. 2002-0040A
Serial No. 10/031,172 : Group Art Unit 1762
Filed: January 17, 2002 : Examiner E. Tsoy

A PROCESS FOR FORMING A MULTI-LAYER COATING FILM

DECLARATION UNDER RULE 1.132

Commissioner for Patents
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Sir:

I, Yasushi Nakao, hereby declare as follows:

That I graduated, in March 1983, at Nagoya University, the Department of Engineering, the Course of Synthetic Chemistry, and, in March 1985, finished the Master Course of Synthetic Chemistry in the Department of Engineering Research of the same university;

That I am one of the co-inventors of U.S. Application Serial No. 10/031,172;

That the following experiments were carried out by myself, or under my supervision and control.

Example 1

A steel plate which had been coated with cationic electrodeposition paint and then heat-cured was coated with polyester resin-melamine resin-type intermediate paint [containing, in an organic solvent, 3 phr of flat talc of a size of 5 µm in longer direction and 0.5 µm in thickness, 80 phr of titanium white (particle size: 0.2 µm) and 1 phr of carbon black (particle size: 0.1 µm)] to a film thickness of 30 µm. After left still for two minutes at a room temperature, thus coated steel plate was further coated with thermosetting acrylic resin type metallic paint (film thickness: 15 µm) and thermosetting acrylic resin type clear paint (film thickness: 40 µm) in order, and, thereafter, thus applied three layers of coating film were heated at 140°C for 30 minutes and were thereby simultaneously cured. The chipping resistance and the smoothness (sense of gloss) of thus obtained multi-layer coating film were evaluated by the following method.

Chipping Resistance:

There was sprayed about 500 ml of marble having a diameter of 15 to 20 mm on the surface of multi-layer coating film at an incident angle of 45 degrees, at an air-spray pressure of about 4 kg/cm² and an ambient temperature of -20°C, by using Q-G-R Gravelometer (trademark of a product manufactured by Q Panel Co.), and, then, the coating surface was visually observed. The standard of evaluation is as follows:

5: Whereas intermediate coating film had slightly peeled off, electrodeposition coating film had hardly peeled off.

4: Whereas intermediate coating film had peeled off a little bit (which means more than "slightly"), electrodeposition coating film had hardly peeled off.

3: Intermediate coating film had much peeled off, and electrodeposition coating film had partially peeled off.

2: Intermediate coating film had peeled off a great deal (which means more than "much"), and also electrodeposition coating film had peeled off considerably (which means less than "much").

1: Almost all intermediate coating film had peeled off, and electrodeposition coating film had much peeled off.

Coating Surface Smoothness

With use of a specular glossmeter, reflectance was measured when both incident angle and received angle were 20 degrees, and, thus, the degree of smoothness was examined. The higher the reflectance is, the better is smoothness.

Results are shown later in Table 1.

Examples 2–13

Example 1 was repeated except that, in the intermediate paint as used in Example 1, the flat talc which is mentioned in Example 1 was replaced with talc of such a size in longer direction and in thickness as shown in Table 1, and/or that the amount of titanium white used was changed as shown in Table 1. Results are shown in Table 1.

Comparative Examples 1–8

The same as mentioned in the present specification, page 6, line 5 to page 9, line 25. Results are shown in Table 2.

Comparative Example 9

Example 1 was repeated except that, in the intermediate paint as used in Example 1, the flat talc was replaced with the same amount (3 phr) of kaolinite (particle size: 4 µm). Results are shown in Table 2.

Comparative Examples 10–15

Example 1 was repeated except that, in the intermediate paint as used in Example 1, the flat talc which is mentioned in Example 1 was replaced with talc of such a size in longer direction and in thickness as shown in Table 2, and/or that the amount of titanium white used was changed as shown in Table 2. Results are shown in Table 2.

Table 1

	Examples												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Talc	Size in longer direction (μm)	5	8	5	5	5	0.8	9	3	7	5	5	5
	Thickness (μm)	0.5	0.5	0.8	0.5	0.5	0.2	0.5	0.05	0.9	0.5	0.5	0.5
	Amount (phr)	3	3	3	5	3	3	3	3	3	3	3	1
Amount of titanium white (phr)	80	80	80	78	46	80	80	80	80	41	91	82	78
Total pigment content (phr)	84	84	84	84	50	84	84	84	84	45	95	84	84
Chipping resistance	5	5	5	5	4	4	5	4	5	4	5	4	5
Coating surface smoothness	85	80	75	68	86	87	77	86	71	88	81	88	80

Table 2

	Comparative Examples														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Size in longer direction (μm)	—	Clay	BaSO ₄	Mica	15	5	5	5	Kaolinite	11	9	5	5	5	5
Talc Thickness (μm)	—				0.5	0.5	0.5	0.5		0.8	1.4	0.5	0.5	0.5	0.5
Amount (phr)	0	3	3	3	3	3	20	3	3	3	3	3	3	0.4	5.5
Amount of titanium white (phr)	80	80	80	80	30	106	.75	80	80	80	31	101	82.6	77.5	
Total pigment content (phr)	81	84	84	84	34	110	96	84	84	84	35	105	84	84	
Chipping resistance	1	2	1	3	5	3	3	5	2	4	5	3	4	2	5
Coating surface smoothness	90	85	85	60	30	90	75	10	88	41	35	88	58	85	58

As is shown in the above Table 2, when talc is replaced with clay, barium sulfate, mica or kaolinite in the intermediate paint, even though both the content thereof and the total pigment content fall within the range as specified in Claim 1 of the present application, it is impossible to produce a multi-layer coating which has good chipping resistance (see Comparative Examples 2-4 and 9).

Furthermore, when the size in the longer direction of talc which is blended with intermediate paint falls outside the range ($0.5 \sim 10 \mu\text{m}$) as specified in Claim 1 of the present application (Comparative Examples 5 and 10), when the thickness of talc falls outside the range ($0.01 \sim 1 \mu\text{m}$) as specified in Claim 1 of the present application (Comparative Example 11), when the content of talc falls outside the range ($0.5 \sim 5 \text{ phr}$) as specified in Claim 1 of the present application (Comparative Examples 8, 14 and 15) or when the total pigment content in intermediate paint falls outside the range ($40 \sim 100 \text{ phr}$) as specified in Claim 1 of the present application (Comparative Examples 6, 7, 12 and 13), it is evidently impossible to produce a multi-layer coating which is well-balanced in chipping resistance and coating surface smoothness.

The undersigned declarant declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application of any patent issuing thereon.

Signed this 4th day of March, 2004

Yasushi Nakao
Yasushi Nakao